Objective: Factor trinomials of higher degree completely

Concept

Factoring Trinomials of Higher Degree Completely

1. Factor out any GCF (remember, this can be a numerical and/or a variable factor)
2. Factor Trinomials into Two Binomials (if possible)
3. Factor any difference of two squares: $(a)^2 - (b)^2 = (a + b)(a - b)$

Objective: Factor trinomials of higher degree completely

Ex) Factor each polynomial completely.

$$x^4 - 25x^2 + 24$$

$-1, -24 \qquad -12, -2$
$-8, -3$
$-6, 4$

① gcf = 1 $\qquad x^? \cdot x^2$
$x^3 \cdot x$

② two binomials $\rightarrow$ $(x^2 - 1)(x^2 - 24)$

$(x)^2 - (1)^2$

check $\quad \checkmark x^4 - 24x^2 + \checkmark 24$
$\qquad -1x^2$
$\qquad \underline{\checkmark -25x^2}$

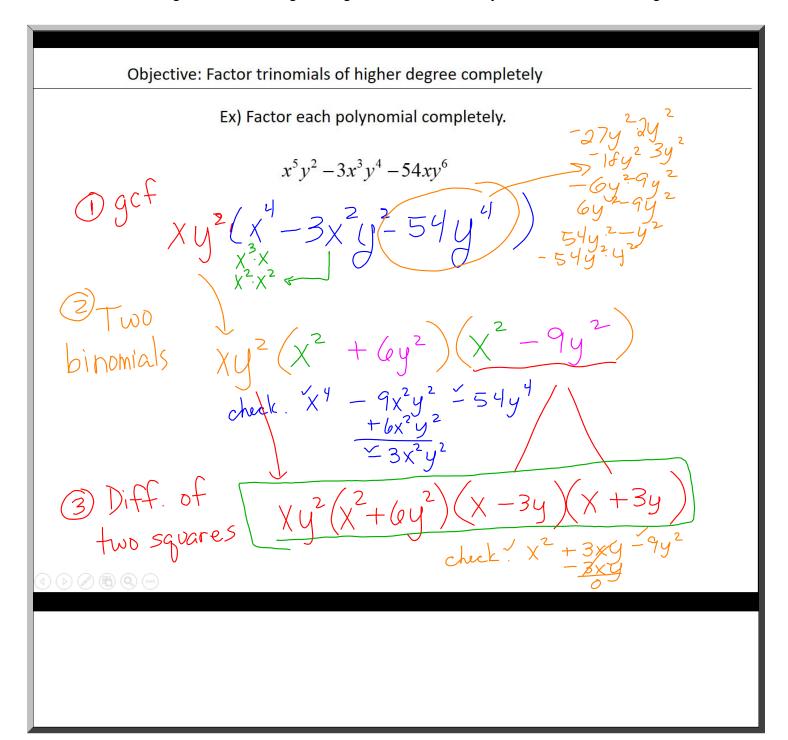③ Difference of squares? $\boxed{(x+1)(x-1)(x^2-24)}$

Objective: Factor trinomials of higher degree completely

Ex) Factor each polynomial completely.

$$4x^4 - 26x^3 y + 40x^2 y^2$$

① gcf

$2x^2(2x^2 - 13xy + 20y^2)$

$2x \cdot x$

$1y \cdot 20y$

~~$2y \cdot 10y$~~

$4y \cdot 5y$

② Two binomials

$2x^2(2x - 5y)(x - 4y)$

③ Diff. of squares?

check $2x^2 - 8xy + 20y^2$

$-5xy$

$-13xy$

$2x^2(2x - 5y)(x - 4y)$

Objective: Factor trinomials of higher degree completely

Ex) Factor each polynomial completely.

$$5x^4 y - 15x^3 y + 20x^2 y$$

① gcf

$$5x^2 y (x^2 - 3x + 4)$$

$$\begin{array}{c} -2 \quad -2 \\ -4 \cdot 1 \end{array}$$

② Two binomials

$$5x^2 y (x - 2)(x - 2)$$

check $x^2 - 2x + 4$

$\quad -2x$

$\quad -4x$

$$\boxed{5x^2 y (x^2 - 3x + 4)}$$

Objective: Factor trinomials of higher degree completely

Ex) Factor each polynomial completely.

$$x^5y^2 - 3x^3y^4 - 54xy^6$$

① gcf

$$xy^2(x^4 - 3x^2y^2 - 54y^4)$$

$x^3 \cdot x$
$x^2 \cdot x^2$

$-27y^2 \cdot 2y^2$
$-18y^2 \cdot 3y^2$
$\Rightarrow -6y^2 \cdot 9y^2$
$6y^2 - 9y^2$
$54y^2 - y^2$
$-54y^2 \cdot 4y^2$

② Two binomials

$$xy^2(x^2 + 6y^2)(x^2 - 9y^2)$$

check. $\overset{\checkmark}{x^4} - 9x^2y^2 \overset{\checkmark}{-} 54y^4$
$\dfrac{+6x^2y^2}{\overset{\frown}{-}3x^2y^2}$

③ Diff. of two squares

$$xy^2(x^2 + 6y^2)(x - 3y)(x + 3y)$$

check $\checkmark$ $x^2 + 3xy - 9y^2$
$\dfrac{-3xy}{0}$

Objective: Factor trinomials of higher degree completely

Ex) Factor each polynomial completely.

$$4x^2 - 2xy - 2y^2 \qquad \rightarrow \quad -y \cdot y$$

① gcf

$$2(2x^2 - xy - y^2)$$
$$\quad\quad 2x \cdot x$$

② Two binomials $\quad 2(2x + y)(x - y)$

check. $\quad 2x^2 - 2xy - y^2$
$$\quad\quad\quad\quad +1xy$$
$$\quad\quad\quad\quad \overline{-xy}$$

③ Diff. of squares

$$\boxed{2(2x+y)(x-y)}$$